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One class of first graders used Sullivan's Programmed Reading for the 1966 school year and continued in the program through the second grade. The first-grade teacher used the program again with her 1967 class. An evaluation was conducted of the use of programed reading for these two groups as compared with the use of Scott, Foresman's basal readers for other first- and second-grade classes in the same school. The structure and rationale of programed reading are described, as well as its introduction and execution in this school. To obtain data for evaluation school personnel were interviewed, test data were tabulated, and children were interviewed and informally tested. The data were not analyzed by means of statistical tests. The advantages of programed reading over the basal reader included greater independence in individual work, a wider range of materials in use, and greater quality and quantity of written work. Suggestions for correcting the limitations observed in programed reading included providing more oral reading activities, substituting small-group skill practice for whole-class skill teaching, and providing closer supervision to assure growth in word recognition and comprehension. Appended are a review of programed reading from the Harvard Office of Programmed Instruction, reviews of related research, tables of pupil data, and references. (CM)

N-56

An Evaluation Report

for the

Bureau of Curriculum Innovation

State Department of Education

182 Tremont Street

Boston, Massachusetts 02111

Summer, 1968

Sullivan Programmed Reading

at Burgess Elementary School

Sturbridge, Massachusetts

The Ad Hoc Evaluation Committee visited Sturbridge and held its meeting during the week of June 3-7, 1968. The members of the Ad Hoc Committee do not necessarily endorse this innovation by the mere act of having written and contributed to various portions of this report. Under no circumstances does any committee member feel that this innovation should be adopted without local review of the materials and other competitive programs.

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Programmed Reading published by Webster Division, McGraw-Hill Book Company (copyright 1963 by Sullivan Associates), was introduced into the Burgess Elementary School in Sturbridge, Massachusetts, in 1966. One class of first graders and their teacher initiated the program. In 1967 this teacher (Mrs. A) again used Programmed Reading with her new first grade class. The original first grade class continued with this reading series in the second grade with their second grade teacher (Mrs. B). In June, 1968, the Ad Hoc Sturbridge Reading Committee was formed by the Bureau of Curriculum Innovation, Massachusetts Department of Education, and this group conducted an evaluation of Programmed Reading as used in the Burgess Elementary School. This is the report of the Committee.

I. LOCATION OF THE STUDY

Sturbridge is a town in the southwestern corner of Worcester County. Its estimated population (as of 1965) is approximately 4,000. In population it was 216th of 356 cities and towns in Massachusetts in the 1960 state census. Sturbridge and four other towns comprise Elementary School Union #61 and feed into the Tantasqua Regional High School.

II. STRUCTURE AND RATIONALE OF PROGRAMMED READING

A. Materials:

Programmed Reading is a reading system consisting of:

1. prereading materials;
2. programmed texts for the children which emphasize independent work for the children at their own pace;

3. test booklets which provide an evaluation for each book in the program;
4. supplementary story books which are written to parallel the vocabulary in the programmed readers so that after completing reading book 1 the students may read story book 1, etc.;
5. supplementary filmstrips to precede each programmed reader;
6. teacher's guides for the programmed readers, the test booklets, and the filmstrips;
7. supplementary ditto sheets to accompany the first 14 programmed readers and the first 7 story books;
8. and placement examinations designed to place transfer students or remedial students in the appropriate programmed reader.

All of these materials are divided into four series: a prereading series, and Series I, II, and III with a total of 21 programmed readers.

B. Characteristics of the System:

The system is designed to be used as a basic text for beginning readers and also for remedial readers. The plan is to first introduce the written symbols, then teach the relationship of each symbol to the corresponding sounds in words. These grapheme-phoneme correspondences are taught in a highly structured program which systematically introduces each relationship and uses a controlled vocabulary to emphasize the regularity of these relationships. Function words of high frequency in the language are introduced as "sight words" at the rate of two or three per book in the first two series of programmed readers (14 books) and other "sight words" necessary for particular story content are introduced throughout Series III.

One of the unique features of the system is the format of the readers which are programmed, in the strictest sense of the word. Students work independently in the readers and are required to give a written response to a segment of text. They then immediately check this response against the answer given in the left hand margin of the reader which should have been covered with a cardboard slider. The segments requiring a response become larger and more complex in terms of number of grapheme-phoneme correspondences, number of unique words, number of words, sentence length and syntactic complexity, and number of sentences within the segment.

Details of the sequence and rate of introduction of the letter-sound correspondences, the vocabulary, punctuation, etc. are outlined in the flow chart printed by the publisher. The sequence is logical and stands up to rigorous linguistic evaluation.

C. The Teacher's Role:

After all children are assigned to and working at the appropriate level of independent work in the programmed readers, the teacher's role is varied. The following suggestions to the teacher are cryptic summaries of those found in the teacher's guide.

a. Circulate throughout room when children are working, stopping to ask for oral reading of specific words or sentences, and engage in dialogue relevant to the page he is working on.

b. Correct unit tests within each book for each student as soon as he completes the test and have him read sentences orally to you.

c. Allow students to progress through programmed readers (the students' major activity in this program) at their own pace.

d. Help slower children - listen while they go through their independent work, guide their reasoning in answering questions, etc.

e. Analyze students problems and work on those specific needs rather than having students redo a book or unit.

f. Express interest in each child's work and reinforce his independent efforts.

g. Maintain an attitude toward reading that will be motivating to children.

h. Present new sound-symbol information and related exercises in the sequence given in the book. (It is left to the teacher's discretion as to whether to proceed with the whole class or with groups, and whether to present this information before or after students have worked with it in their books.)

i. Give students word discrimination exercises (word recognition). (Again, and also with "j" through "l," infra, the timing of the presentation of these is left to the discretion of the teacher, but specific exercises are given in the guides.)

j. Give word formation exercises (spelling)

k. Give word review exercises

l. Give dictation exercises

m. Provide for oral reading of selections from readers and discussion of these selections <u>after</u> students have worked through passages independently. The type of suggested questions progresses from factual (who, what, when, etc. in reader 1) to interpretive and inferential.

n. Provide for oral reading and discourse in storybooks using all types of questions.

o. Encourage creative writing (suggestions in guide) and art.

D. <u>Story Content</u>:

Series I (Books 1-7) describes a few standard characters and their pets. Soon in the books the items combine to create a paragraph effect.

Series II (Books 8-14) includes science topics, fairy tales, and everyday adventures - some with fantasy.

Series III (Books 15-21) utilizes topics that are sometimes sustained throughout a book. Many stories relate Greek myths.

For further information on the structure and rationale of <u>Programmed Reading</u>, see Appendix A.

III. INTRODUCTION OF PROGRAMMED READING

Prior to the introduction of Programmed Reading, the basal reading system in use at the Burgess Elementary School was the Scott-Foresman basal readers. This system was being used by the non-programmed instruction classes in grades one and two at the time of the visit by the Committee. It was not the most recent edition of the Scott-Foresman series, but was the 1963 edition.

In 1966, Mrs. A, a teacher with 22 years of teaching experience, was asked several weeks before the school year began to teach Programmed Reading. Some assistance was received from a consultant representing the publisher. Except for this, Mrs. A was largely on her own. Mrs. A attempted to conduct the Programmed Reading system as described in the teacher's guide.

Mrs. B was asked to continue with the same children in their second grade class. She was then a teacher with 16 years of experience. She reported that she, too, attempted to follow the teacher's guide closely.

IV. EXECUTION OF THE PROGRAM

This section describes the program in operation as the Committee saw it.

What have we observed at the Burgess Elementary School; Sturbridge, Massachusetts? An air of enthusiasm and commitment pervaded the innovating classrooms to an extent where it became most difficult for the team of observers not to be caught up in the contagion of the trial. With a great sense of determination and self-reliance, both teachers and students in this innovative

program moved purposefully from task to task as they sought to do "better than their best" in the teaching-learning process. Although styles of teaching and learning differed among the Programmed Reading classrooms, there were some areas of commonality in evidence, and these will be enumerated below.

Children worked independently in their readers at their own rate. When all the children worked in their readers, the teacher circulated about the room in order to provide some individual instruction to children as they appeared to need or request help. The children seemed to enjoy the illustrations in their texts.

Skills (auditory and visual discrimination; introduction and review of phonic generalizations) were presented to the entire class, but were geared to the average. Pupils working at levels lower than this receive further instruction and reinforcement when they have reached the point at which the specific skills were needed. Children at higher levels receive individual assistance from the teacher or another child, or were able to discover the principle and master the skill independently because of the structure and reinforcement features built into the program.

The Committee observed samples of the pupils' creative writings which suggested both increased spelling power and facility in written expression. Save for the mathematics program, concerted effort was made to integrate all of the other content subjects within the reading program.

Children were grouped into three or four groups for oral reading. Stories usually were at the reading level of the poorest reader in the group. Stress by the teacher on expression and fluency varied. Word - by - word and "round - robin" reading was

noted, as well as reading with good expression, preceded by questions from the teacher concerning interpretation of mood and feeling of the characters involved. Some errors in oral reading were observed.

Teachers reported that after the pre-reading program had been completed (in first grade) each child advanced at his own rate through each step in the program. Children who completed the entire series were using the SRA Reading Lab. Moreover, supplementary materials available for independent reading included Reader's Digest Skill Builders, library books, and basal readers.

V. EVALUATION OF PUPIL'S READING ACHIEVEMENT

Members of the Ad Hoc Committee visited the Burgess Elementary School from June 3 to June 6, 1968. While at the school, first and second grade classes using Programmed Reading (P.R.) and the Scott-Foresman (S.F.) series were observed; all teachers of the programmed instruction classes, most teachers of the conventional classes, as well as other school personnel were interviewed; test data were made available, and several children in the P.R. classes were interviewed and informally tested. The results of these efforts are the basis for writing this report. The present section of the report will concern itself with the interpretation of test data and spot-testing of children.

The reading test scores presented in this section have not been analyzed by means of statistical tests (tests, etc.). Because the introduction of Programmed Reading in the Burgess Elementary school was not set up as an experiment and therefore did not employ rigorous controls, the Committee agreed that findings of significant

differences could not be interpreted unequivocally in any event. Also, comparison to results of classes using the Scott-Foresman books was not intended to determine if P.R. was superior to the Scott-Foresman program being used, but merely to estimate more adequately the performance of the P.R. children than could be done by considering achievement scores alone. An implied comparison is made to national test norms throughout the study. For these reasons the Committee agreed not to make statistical tests.

A. Comparison of First Grade Classes

The first-grade classes are compared in Table 1. Results on the SRA Achievement Series-Multilevel Edition, Form C, Level 1-2 (administered in March 1968), the California Short-Form Test of Mental Maturity, Form S, Level 1 (administered in November 1967), as well as chronological age (in months as on November 1967) are shown. Excluded are children who are repeating the first grade, children who transferred to Burgess School during the year, and four children from the S.F. group who were absent at the time I.Q. tests and/or reading tests were administered.

This comparison shows the results of reading instruction using Programmed Reading (P.R.) in one class and the Scott-Foresman (S.F.) series in three other first grade classes. Certain factors tend to make this a valid comparison, even though certain steps were not taken that would have been taken had these classes been organized according to a rigorous research design. Children were not intentionally assigned to classes in a manner that would clearly have led to non-equivalent groups. Orderly assignment was made from alphabetical registration lists. I.Q. and chronological age of P.R. and S.F. groups do not differ significantly. The

TABLE 1

COMPARISON OF 67-68 FIRST GRADE CLASSES ON TOTAL READING SCORE, I.Q., AND CHRONOLOGICAL AGE (C.A.)

Reading Program	n	Total Reading (3/68)			I.Q.			Chronological Age		
		Range	Mean	S.D.[a]	Range	Mean	S.D.[a]	Range	Mean	S.D.[a]
		Lo Hi			Lo Hi			Lo Hi		
P.R.[b]	21	1.6 4+	3.11	.71	96 132	113.00	10.0	71 80	75.2	2.54
S.F.-1	16	1.0 2.6	1.76	.48	91 132	112.75	11.9	71 82	76.5	3.69
S.F.-2	21	1.0 3.4	2.04	.74	91 131	109.86	9.8	71 82	76.1	3.51
S.F.-3	22	1.0 2.6	1.70	.50	70 121	101.45	13.4	71 83	77.3	4.85
Total S.F.	59	1.0 3.4	1.84	.60	70 132	107.51	12.6	71 82	76.7	4.06

[a] Throughout this report, the formula used to compute S.D. is

$$SD = \sqrt{\frac{\Sigma x^2}{n - 1}}$$

[b] Raw data on the P.R. Group are reported in Appendix C.

proportion of boys to girls in the two groups is fairly similar; a slightly but not significantly larger proportion of girls is in the P.R. groups (8 boys to 13 girls in P.R. and 29 boys to 30 girls in total S.F.). The proportion of children having kindergarten experience in each group does not differ significantly (18 of 21 in P.R. and 44 of 59 in Total S.F.).

Certain limitations on generalizing from these results must be noted. First, there is clearly a difference in the amount of teaching experience of the P.R. and the S.F. teachers. Mrs. A, the teacher of the first grade P.R. class had 24 years of experience as of June 1968, however she was teaching P.R. for only the second year. The three teachers of the S.F. classes had 3, 7, and 10 years of experience. Although quality of teaching is not necessarily related to number of years of teaching, the difference in teaching experience must be acknowledged. Second, a large proportion of children have had kindergarten experience. The kindergarten program in Sturbridge is in its second year, and this is the first group of first graders who have profited from this program. Members of the Committee who visited the kindergarten reported that it was oriented to developing reading readiness. It will be shown later that the kindergarten experience may have contributed greatly to pupils' reading achievement. Third, it must be noted that all pupils in the P.R. class were of average or above average intelligence, thereby preventing us from generalizing to below average groups. Finally, the reading test used has a ceiling of 4.0. Five children in the P.R. group received a score of 4+, whereas no children in the S.F. group attained a score of 4+. This fact tends to lower the mean score attained by the P.R. group.

In conclusion, it appears that Programmed Reading was an effective basal reading program for the first graders of average or above average intelligence, most of whom had had a kindergarten program, and who were taught by an experienced teacher. This finding is consistent with the findings of Liddle (13), Ruddell (17) Della-Piana (3), and the Denver Studies (5) that showed Programmed Reading compared favorably to conventional basal readers (see Appendix B).

B. Comparison of Second Grade Classes

The Committee wished to compare all children using Programmed Reading for two years with children using Scott-Foresman for two years. This would include children now in the second grade and children repeating the first grade. However, three children originally in S.F. are repeating first grade in the P.R. class. Therefore, only second-grade children on whom complete data were available are compared. Those not compared were children then repeating first grade (one from P.R. and seventeen from S.F. at the end of first grade), children who had repeated an earlier grade, children who transfered into the school within the two years, and one child from the P.R. group on whom test data were incomplete because of absence at the time of testing.

Table 2 shows results on the SRA Achievement Series-Multilevel Edition, Form C, Level 1-2 (administered in March, 1968); the California Short-Form Test of Mental Maturity, Form S, Level 1 (administered in October 1966); as well as chronological age (in months as of October, 1967.

TABLE 2

COMPARISON OF SECOND GRADE CLASSES ON TOTAL READING SCORE, I.Q., AND CHRONOLOGICAL AGE (C.A.)

Reading Program	n	Total Reading			I.Q.			Chronological Age		
		Range	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.
		Lo Hi			Lo Hi			Lo Hi		
P.R.	19	2.6 4+	3.57	.60	91 137	111.74	11.8	82 93	87.2	3.30
S.F.-1	17	2.6 4+	3.46	.55	89 130	111.29	15.8	84 90	87.5	3.35
S.F.-2	16	2.5 4+	3.43	.56	93 144	108.25	13.0	84 93	87.7	2.82
Total S.F.	33	2.5 4+	3.44	.55	89 144	109.82	14.4	84 93	87.6	3.06

The groups do not differ significantly in I.Q. and chronological age. The proportion of boys to girls in each group does not differ significantly (13 boys to 6 girls in P.R. and 20 boys to 13 girls in S.F.). The P.R. group was not significantly different in reading achievement from the S.F. group. When these children were initially assigned to first grade classes, no bias was intentionally introduced at the time of this assignment; orderly assignment was made from alphabetical registration lists. But the present P.R. and S.F. groups may not be equivalent in some respects because of transfers from Burgess School at the end of first grade and because of the number of retentions in the first grade. In addition, it is to be noted that four first grades were consolidated to form these three second grades, with the S.F. classes initially having larger class enrollments.

Other factors to be considered in interpreting these results are as follows. The second grade P.R. teacher had 17 years teaching experience (as of June, 1968). The S.F. teachers had 16 and 23 years experience. In regard to experience, S.F. teachers can be considered at least equivalent to the P.R. teacher. However, the second grade children had spent a year with first grade teachers as well. The P.R. children (who had Mrs. A in first grade) may have been in a favored position in comparison to some of the second grade S.F. children whose first grade teachers had fewer years of experience than Mrs. A. (These are not the same teachers the present first grade children have). Another factor is that none of the second grade children had kindergarten experience, as Sturbridge had no public kindergarten program when the second grade children

were of kindergarten age. A third factor is the nature of the test scores, themselves. The reading test used has a ceiling of 4.0. All groups scored rather close to that ceiling; many children received a score of 4+. This fact tends to make it difficult to show real differences that may exist between the groups. Table 3 shows the number of second-grade children in each group scoring 4+.

TABLE 3

NUMBER OF SECOND-GRADE CHILDREN SCORING 4+ IN READING

Reading Program	Total n	Number Scoring 4+
P.R.	19	9
S.F.-1	17	5
S.F.-2	16	7

As a further check on the equivalence of children who scored 4+ in total reading, comparable students from P.R. and S.F. groups were given the Gray Oral Reading Test Form A. The children chosen were comparable according to I.Q., chronological age, and sex. Data on these children are presented in Table 4.

TABLE 4

GRADE EQUIVALENCY SCORES ON COMPARABLE PAIRS OF SECOND-GRADE CHILDREN ON THE GRAY ORAL READING TEST

PAIR-SEX	Reading Program	Gray Oral Score	Ceiling (Grade Level of Passage)	Chronological Age 3/68	I.Q.
Boys #1a	P.R.	3.7	4	8-2	99
Boys #1b	S.F.	2.9	3	7-10	99
Boys #2a	P.R.	3.4	6	7-4	120
Boys #2b	S.F.	2.0	2	7-5	119
Girls #1a	P.R.	3.3	3	8-0	110
Girls #1b	S.F.	3.1	3	7-11	108
Girls #2a	P.R.	2.2	2	7-5	122
Girls #2b	S.F.	2.5	3	7-9	122

Of the P.R. children tested, the highest ceiling was established at the grade 6 passage. Of the S.F. children, the highest ceiling was established at the grade 3 passage. The examiner observed that the P.R. children were able to attack more words than the S.F. children. However, they did not do better in the comprehension check than did S.F. children. Also, S.F. children made far more omissions than P.R. children tested (a total of 36 and 13 respectively) although they read fewer paragraphs.

Mean reading scores on the SRA Achievement Test and level of performance on the Gray Oral suggest that Programmed Reading was a satisfactory reading program for the second-grade children in the P.R. group, yielding results that were at least as good as those obtained by children taught with Scott-Foresman.

It is recommended that the present first grade children be followed carefully in the second grade. Children retained in first grade, if retained in the same basal reading program, would enable a clearer evaluation of second year progress. Both second graders (in 1969) and first grade repeaters should then be tested with an instrument having a higher ceiling.

C. Progress Made in the Second Year of Programmed Reading

It is of interest to note the amount of gain made during the second year of using Programmed Reading. The major limitation in interpreting these results has already been explained above, viz. the ceiling on the second grade achievement test is too low; 9 of the 19 children scored 4+. Table 5 compares the reading scores on alternate forms of the SRA Achievement Test given in 1967 and in 1968 for the second grade P.R. group. Included are the 15 of the 19 children for whom first grade achievement scores were recorded.

TABLE 5

FIRST AND SECOND GRADE READING SCORES OF THE SECOND GRADERS IN THE P.R. GROUP

Pupil	Total Reading Scores		Gain
	First Grade 66 - 67	Second Grade 67 - 68	
1	2.4	4.0+	1.6+
2	3.2	3.8	0.6
3	2.8	4.0+	1.2+
4	2.8	4.0+	1.2+
5	1.5	2.6	1.1
6	2.3	4.0+	1.7+
7	2.4	3.5	1.1
8	2.8	4.0+	1.2+
9	2.2	3.7	1.5
10	1.8	3.7	1.9
11	2.1	4.0+	1.9+
12	2.4	3.6	1.2
13	3.4	4.0+	.6+
14	2.5	4.0+	1.5+
15	2.4	3.5	1.1
Mean S.D.	2.47 .49	3.76+ .38	1.29+

D. Mrs. A's Results with Scott-Foresman and with Programmed Reading:

It was thought desirable to compare Mrs. A's results with Scott-Foresman and Programmed Reading in order to better control the factor of teacher differences. Therefore, we compared the reading scores of Mrs. A's last Scott-Foresman class (tested in Spring, 1966) and her first Programmed Reading class (tested in Spring, 1967). The latter group includes children in Mrs. B's second grade class (Table 2 and 5), first grade repeaters at the time of the 1967 testing, and children who did not enter Mrs. B's second grade class at the end of the 1967 school year. These classes include children repeating first grade and children who may have left the regular track for placement in Special Education Classes. I.Q. scores were not obtained. The comparison, therefore is merely suggestive. Data are presented in Table 6.

TABLE 6

COMPARISON OF MRS. A's LAST S.F. CLASS AND HER FIRST P.R. CLASS (66-67) ON FIRST GRADE READING SCORES

Reading Program	n	Total Reading Level	
		Mean	S.D.
S.F.	23	2.26	.66
P.R.	25	2.24	.66

These data fail to lend support to the results presented earlier which suggested that Programmed Reading may have been more effective than the Scott-Foresman program. This discrepancy with earlier findings may be due to the unreported and uncontrolled variables concerning the two classes compared (as enumerated in the preceding paragraph) or to the fact that neither class had kindergarten experience.

E. Possible Influence of Other Factors:

It is possible that Programmed Reading becomes more effective than Scott-Foresman when it follows a structured, readiness-oriented, kindergarten program in which letter sounds are taught. To examine this possibility, it is helpful to compare the reading achievement of first graders in the Spring of 1967, excluding repeater, with that of first graders in the Spring of 1968. This comparison may enable us to discern the influence of kindergarten experience and/or possibly, the influence of a year's experience with teaching P.R., neither one of which can be estimated separately in this report.

To some degree we can make this comparison by examining Tables 1 and 5. However, unlike Table 1, Table 5 includes only children who were promoted to second grade. Since this limitation may give a high estimate of the 1967 first grade mean reading score by eliminating children who were not promoted, the apparently higher mean score of the present first grade (Table 1) suggests that kindergarten experience and/or the added year's experience in teaching P.R. facilitates pupil progress with P.R.

F. Further Analysis of Data:

Further analysis is made possible for the reader by consulting Appendix C where data presented for individuals in P.R. Pupils are ranked according to the book they are using in P.R. and data on C.A., I.Q. and sex are included. Pupils listed are those represented in Table 1 and 2.

VI. Advantages of the Sullivan Programmed Instruction over the Scott-Foresman Program

Our initial impression of the two P.R. classes was one of students working diligently. They seemed to have a clear idea of their assigned responsibility and were able to carry out these tasks with a minimum amount of teacher assistance. We saw evidence of students working together, and in the second grade class we saw children helping other children both at student invitation and by teacher assignment. Consequently, the teacher was free to work with groups and individuals more than in the conventional groups. The children in the two P.R. classes were noticeably less dependent upon their teacher when doing individual work than their counterparts in the five conventional classes. This observation was sustained and reinforced throughout the time of our observations.

The students in each P.R. class worked quietly in a determined manner while their teacher went from student to student helping them with their immediate task. This is not to imply that the children in the conventional group did not work well, for this was not the case; but the programmed group children were called upon to work alone for much longer periods of time. The teacher in the second grade programmed group took considerable time--ten to fifteen minutes--to talk to visitors. As usual, the children worked quietly at their seats.

The students in the programmed first grade class were working on material which ranged from level 3 to level 13. There are twenty-one levels in the three-year program, with level 21 approximately the end of third grade according to the publishers. In the second grade the range went from 8 to 21 with four students who had

finished the program. This would mean that this second grade had students ranging into fourth grade reading materials. The programmed groups were spread over a wider range than the conventional groups in the same school grade. Furthermore, the top students in the programmed groups were working in more difficult material than their counterparts in the conventional groups. This may be accounted for by the fact that the students in the programmed group can progress as fast as they are motivated to do so. The S.F. group children progressed at the rate of their reading group. The pace here is determined by the teacher. The S.F. groups spent more time listening to the oral reading of their peers and in guided reading where the teacher would ask a question, and a student would respond to her. There was little student-to-student interaction except in one of the S.F. second grades. Here the students acted as "teacher".

We observed that all students working through the P.R. material dis so in the same sequence. The differences had to do with the rate of progress through the sequence and the amount of help they needed from the teacher or other children.

The quality and quantity of written language evident in the classroom at the time of our visit favored the programmed group. This seemed to be a major factor in influencing many of the conventional group teachers to desire to use Programmed Reading. The children's writing ability also helps account for the teachers' reluctance to return to the currently used basal reading program.

In the second grade P.R. group the teacher found that the spelling program used in the school was more than adequately covered

by Programmed Reading, and she no longer used it with the programmed group. Our observations indicated that the programmed group children did in fact show a high degree of accuracy in their written work.

The advantages may be summarized as follows. Children using Programmed Reading learned to work independently for long periods of time. Independent work in their programmed readers taught them new vocabulary and reading skills and also provided an opportunity for overlearning. Whereas grouping in S.F. required some pupils to use a basal text that might be somewhat easy or difficult for them, assignment to a programmed reader enabled each pupil to work in a book at the appropriate level of difficulty. Rate of progress was determined by the individual's ability, rather than by group membership or by the teacher's decision. Pupils were permitted to progress as far as they could in grades one and two, whereas in S.F. it was expected that the third grade teachers would resume instruction at the beginning of the third grade reader for the best readers. Written work of the P.R. children appeared to be very satisfactory.

VII. LIMITATIONS OF PROGRAMMED READING

Spot checks of the reading of several children showed certain discrepancies between expected and actual performance. In some cases, children made word recognition errors when asked to read orally from their programmed readers. It is not known whether these are more serious or frequent than errors made by children using

conventional basal reading series. Also, it was found that some children could not read with expected accuracy from a second grade Scott-Foresman reader although they were using Series III P.R. books. Therefore, the Committee suggests that if children are expected to read trade books or stories in basal readers to supplement Programmed Reading, teachers should periodically ascertain pupils' independent reading levels in these materials.

Closer supervision of children's independent work seems necessary to assure growth in word recognition and in comprehension. The typical response made by a pupil when using Programmed Reading is writing a word. It is necessary to assess his ability to read that word as well as the surrounding context. Often, correct written responses can be given with no assurance that the pupil is responding to the material as the authors intended. This observation is consistent with the findings of McNeil (14) concerning the desirability of oral responses to stimulus words in programmed reading instruction. Also, possible negative effects on development of comprehension may occur when a child may see that his answer was incorrect but not know why. We observed this in the P.R. classroom and also noticed that there was no provision to encourage him to analyze his answer and the correct one.

Children whose independent work is far above or below the level of class teaching of skills or oral reading may possibly better be able to spend their time at another activity. It seemed to the Committee that skill teaching and oral reading instruction in smaller groups of children reading at more nearly the same level would be preferable to whole class lessons used by the P.R. teachers.

Although programmed instruction seemed superior to conventional instruction in enabling children to read at an appropriate level of difficulty, whole class teaching of skills seemed inconsistent with this desirable feature. Even though the teacher's manual does not instruct the teacher to give specific skill lessons only to children at a particular level, it may be desirable to teach specific skills to small groups rather than to the whole class.

More provision than was given to those pupils should be made for opportunities to engage in oral reading activities which would bring such end-results as discussion, sharing ideas, developing thinking skills (especially interpretive, critical, creative, and elaborative thinking). The teacher's manual encourages teachers to call several children together for discussion groups if time is available. The Committee strongly suggests that time be made available in order to insure reading for comprehension and interpretation.

An important decision to be made by Sturbridge or any school system using P.R. concerns selecting an adequate follow-up to P.R. in grades three or four and beyond. In any program that is implemented through the following grades, there should be a continuation of the skills and strengths gained from the P.R. system. Because of the characteristics of P.R. described elsewhere, reading materials used in a follow-up program should provide continued development of word meaning vocabulary, comprehension, and study skills. A school system might consider using a newer basal reader approach, one that does not restrict its vocabulary according to a word frequency count principle, and will permit children to continue to develop in word

recognition ability. The teachers who will be involved should explore available materials and programs, then choose the program or programs they consider most appropriate. Third grade teachers should be prepared to continue P.R. with those children who have not yet completed the program, and move children to the follow-up program as they complete P.R. Children should enter the follow-up program at their actual reading level.

A school system desiring to use P.R. or a similar basal reading program will have to be aware of the financial cost of the program. Because of the quantity of materials which are consumable, P.R. may be more expensive than the conventional basal reader program. The use of plastic overlays permit the reuse of programmed readers and reduces the expense of this reading program.

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A P P E N D I X A

Harvard Office of Programmed Instruction

May 28, 1968

Review of Programmed Reading (McGraw-Hill, 1968)

The following review was done by the Harvard Office of Programmed Instruction expressly for the Ad Hoc Sturbridge Reading Committee. The review is based on an examination of the program according to our standard evaluation procedure and is based on various supporting documents as well. The review is not meant to either endorse or discourage use of the program; it merely offers comments to people considering the program for their own use.

For anyone interested in selecting an elementary-school programmed instruction text in reading, Programmed Reading ranks near the top of the list of texts to be considered. There are other programmed instructional materials in reading and language arts, but Programmed Reading has been more widely used and seems more likely to be successful than the other texts.

Design

Programmed Reading is designed to emphasize the regularities of the language by controlling vocabulary. At each stage, it introduces words chosen to illustrate a new phonic principle, gradually increasing the number and complexity of these principles.

Given a strict vocabulary control, the text manages to be quite interesting. Sentences are natural-sounding and varied, often describing funny or interesting situations. Illustrations are attractive. Whole sentences are used almost from the beginning, to promote the use of context clues as well as to increase interest.

The workbook format calls for the pupil to read a sentence or two, then check his understanding by answering a question or completing a phrase. The amount of uninterrupted text increases until the pupil is reading a long paragraph before answering an item. Supplementary filmstrips and storybooks are designed to review the vocabulary of the workbooks.

The series is designed to allow each pupil to work independently at his own pace. However, the group review activities (filmstrips, suggested chalkboard exercises) would lead to some conformity of pace, especially if the group is large.

Intended Audience

Programmed Reading has had considerable success with below-average as well as average students; however, for very slow students the teacher may need to devise extra review. The series is best used as a major instructional program not as a specific short-term remedy for an isolated reading weakness: it is not broken down into separate phonics lessons but interweaves new material and review into one major sequence.

The Teacher's Role

The prereading materials call for group work. The first lessons, on letter names, are given entirely by the teacher; the Primer is in workbook format, with the teacher introducing the new format. After this, pupils do much independent work but frequent checks on their progress should be made by the teacher. Several gray-bordered test pages are interspersed in each book; the teacher should watch the child do these and have him read some items aloud. The teacher also needs to supervise regularly to be sure that pupils cover the answer column and that they read the entire sentence or paragraph before filling in the answer.

Possible Adaptions by the Teacher

By Book 5, the pupil is expected to learn a new phonic principle by seeing it illustrated in just a few words, and then to use that principle to decode many new words. If a pupil fails any unit test, it is important to give him extra review before sending him on to more difficult material. Filmstrips, storybooks, and Webstermaster (ditto) exercises offer review; ideas for other exercises are given in the Teacher's Guide. The "word families" exercises (in Teacher's Guide) have been found very helpful and probably should be done by most children.

At the very beginning of the series, the child is expected to learn the names of all letters, in both upper and lower case, before learning any words. This seems very tedious and very taxing to a young child's memory. One alternative is to teach only the 8 letters the child will need to read the Primer, then use the Primer normally, then teach the letters of Book 1, and so on.

Publisher's Revisions

September 1968 is the distribution date for revised versions of the Prereading materials, Books 1-15, and Teacher's Guides to them. The publishers describe the revisions as:

1. A change in design of the Prereading materials to introduce letters gradually (as described under possible adaptations to the existing materials). The Prereading stage will include Reading Readiness (names and sounds of a,i,m,p,t,n), followed by a Prereader (reading of 16 words containing these letters, writing sentences no relation to the existing Prereader).

The existing Prereader (review for slower learners) will be replaced by Book IA, to be used after Book I.

2. An increase in the amount of review in Books 1-15, including 40% more response items in the text and suggestions in the Teacher's Guide for more teacher-directed group activities.
3. Fewer within-books tests; one every 36 pages instead of about every 22 pages.
4. The addition of a Negro boy to the cast of characters in the text.

The new materials were not available for evaluation, but the plan of revision seems very good, with the possible exception of #3: the teacher's checking of each pupil's progress is very important and probably should not be decreased. Since there will be fewer tests in the new materials, the teacher may find it necessary to make spot checks between tests.

A P P E N D I X B

Beckmeyer, T. "Application of Programmed Instruction to Remedial Reading for the Deaf." Volta Review, 65 (October 1963), pages 415-417.

Summary: Programmed materials for teaching reading to hearing children were used in an experimental remedial reading program in a school for the deaf. The success of the program with one group, as compared with the control group, indicated the feasibility of using programmed material designed for hearing students in teaching the auditorially handicapped. The study was conducted at Mill Neck Manor Lutheran School for the Deaf, Long Island.

Material: Three units of linear-type remedial reading program, published by Center for Programmed Instruction, New York. The program asks for an entry reading level of 3.0.

Procedure: Ten students were chosen for study. Group A (5 students) was designated as a high ability group. All students in this group read above a 3.0 level, with a mean of 3.7 on the California Reading Test. Group B (5students) was designated as a low ability group. The range of reading abilities of this group was from 1.9 to 2.9, with a mean of 2.2. The procedure was identical for both groups as they proceeded through the material.

Results: Gain Scores were significantly higher for the high ability group than for the low ability group.

Interpretation: Group A did significantly better on the posttest primarily because they met the entry criterion of the program.

Deaf students can benefit from programmed material which has been designed for hearing students.

Burkott, Ann P., and Clegg, Ambrose A, Jr., "Programmed vs. Basal Readers in Remedial Reading." The Reading Teacher, 21 (May 1968), pp. 745-748.

This study compared two methods of teaching reading in a remedial situation as measured by the behavior of the subjects in silent and oral reading tests and in spelling. The two methods were the Sullivan Associates Programmed Reading and the Betts Basal Readers. Null hypotheses were formulated concerning silent reading, oral reading and spelling proficiency.

Sample and Procedure: Forty mild cases of reading retardation were randomly assigned from a retarded reading population of 152 subjects in grades one, two, and three in two elementary schools in Westfield, Massachusetts. Experimental and control groups were set up in each school for the instruction period of four months. One group in each school was administered a series of pretests while all four groups were administered posttests in this four group design.

Results: No significant differences were found among groups on the measures of oral reading, silent reading, or spelling. All three null hypotheses were accepted.

Della-Piana, Gabriel. "Maximizing Effectiveness of Programmed Reading." Manuscript, 1967.

Summary: The study compared the effectiveness of Sullivan Associates Programmed Reading and the "currently used basals" in first grade classrooms in Salt Lake City.

Hypothesis: Null hypothesis concerned reading gains as measured by standardized reading tests of vocabulary (Gates, MacGinitie) and comprehension (Primary Reading Test). Writing samples were also measured for Number of Words, Number of Dependend Clauses, and T-Units.

Procedure: Programmed Reading was installed in twelve classrooms. Eighteen control classes using basal readers were randomly selected from among first grades in the district. Each teacher was observed to help maintain fidelity to use of the program as outlined. Controls were observed also to avoid the Hawthorne effect. One phase of the analysis involved a breakdown of all pupils into high, middle, and low ability groups based on testing on the Murphy-Durrell Reading Readiness Analysis Total Score. Criterion tests were administered in February and May.

Results: There were significantly greater gains favoring the experimental group for the high and middle ability students on vocabulary and comprehension in the February and May tests. There was no significant difference between the low-ability students of experimental and control groups. On the writing sample the number of words used in a story was not significantly higher for high ability pupils of the experimental group even though it was higher

for middle and low-ability pupils of the experimental group. There were no significant differences on the Clause Index or the T-Unit in the final testing.

Interpretation: Programmed Reading yields achievement gains equal to or greater than currently used basals on measures of vocabulary and comprehension. The use of Programmed Reading positively affects the number of words used in original writing, but it has no significant effect on sentence complexity.

"The Denver Studies." A Report of Eight Studies Comparing Programmed Reading With Other Reading Instruction Systems in Grades One and Two, a publication of McGraw-Hill Book Company, October, 1967, pp. 3-4.

Summary: Seven first grade classes (N = 152) in two schools participated in the experiment using Sullivan Program. Ten first grade classes were chosen randomly from similar schools to serve as a control group (N = 325), using a basal reading program. The two groups had indentical mean ages (77 months) and nearly identical mean IQ scores (E = 93, C = 95). At the completion of one year of instruction, all students were tested on the Metropolitan Primary Reading Test, with subtest scores of Word Knowledge, Word Discrimination, and Reading Comprehension. The Experimental group did significantly (.001) better on all three areas of the test. A further breakdown of performance of both groups by IQ into low, middle, and high subgroups revealed that of the nine scores (3 groups, 3 test variables), comparisons showed that middle and high ability groups benefitted proportionately more from the programmed materials. Older children did slightly better than younger children, but there were no significant differences in performance between boys and girls.

Jeannes, Sister Mary, R.S.M. "Programmed Reading: How Successful?" Journal of Programmed Reading, a publication of McGraw-Hill Book Co., 3, pp. 1-2+.

Procedure: Seventy first grade students from St. Francis Xavier School, Grand Rapids, Michigan, were matched on the basis of IQ (California Mental Ability test) and assigned to either the experimental or control group. IQ range was from 134 to 84. The 35 children in the experimental group used Sullivan Associates Programmed Reading as the basic text. The Faith and Freedom Series published by Ginn and Company was the basal program for the control group. Both groups used supplementary materials in addition to their basic program. Teachers were considered to be equally qualified.

Hypothesis: More than one hypothesis was advanced, but because this is a preliminary report, statistical findings are given only for the null hypothesis concerning the two programs.

Results: The study began in the fall of 1964. The Gates Primary Reading Test was administered to both groups in January 1965. The experimental group had a mean score of 86.1 and the control group a mean of 63.1, a t-value significant at the .001 per cent level.

Liddle, William. "Colorado Springs Tests Programmed Reading." Journal of Programmed Reading, a publication of McGraw-Hill Book Co., 6, pp. 1-6.

Summary: Four schools were selected to participate in the experiment in Colorado Springs. One classroom in each school used Sullivan Associates Programmed Reading materials for the teaching of reading to first graders. These were designated the experimental groups. A second classroom and a different teacher were designated as control group to continue teaching with the McKee basal reading series published by Houghton Mifflin Company. Reading scores on the Metropolitan Achievement Primary I Battery were compared for the two classrooms in each school and total scores were compared for the four experimental and four control groups at the end of the school year (1965-1966).

Hypotheses: That there would be no significant differences between the Experimental and Control groups in word knowledge, word discrimination, or total reading at the end of instruction.

Procedure: The total number in the Experimental group was 114; the total number in the Control group was 113. There were 62 girls and 52 boys in the Experimental group and a like number in the control. Instruction was given for 180 days in the prescribed manner that is suggested in the use of the materials. The eight teachers involved in the experiment had varying amounts of experience (from 1 to 25 years), but all were considered to be fine teachers. However, the median experience of the four experimental teachers was 11 years. The median experience of the four control teachers was 3 years.

Although all first grade children had taken the Metropolitan Readiness Test at the beginning of the school year, it was impossible to further utilize this test in the experiment because so many students had moved in and out of the school during the year. IQ tests were not utilized because scores could not be made available for all students.

Results: Although the results varied in each school, any significant differences were always in favor of the Experimental group. When all groups were combined, there was a difference significant at the .02 level in word knowledge, favoring the Experimental group. There was a difference at the .01 level between the two groups in both word discrimination and in total reading, favoring the Experimental group.

Interpretation: The instructional program as carried on by means of Programmed Reading was either as good as the basal reader, or in some instances better. These results must be considered in light of the fact that the experimental teachers had 4, 9, 13, and 14 years of experience. The control teachers had 1, 2, 4, and 25 years experience.

McNeil, John D. "Programmed Instruction as a Research Tool in Reading: An Annotated Case," Journal of Programmed Instruction, 1 (Spring 1962), pp. 37-42.

Research involved programmed instruction designed to teach 40 words singly and in sentences.

Hypothesis: "...Beginners in reading who were taught word recognition by a method which required oral responses to stimulus words would learn to recall, identify, and comprehend more printed words and sentences than those children who must respond appropriately to the stimulus words without saying them aloud." (p. 37)

Conditions: Daily 15-minute sessions for three weeks. 188 representative kindergarten children (IQ range 67-138) randomly assigned to two matched oral and non oral groups, subdivided into 26 teams in 3 schools. Language lab cubicle and response panel were used and taped commentary provided instruction. Oral group used a microphone and responses were monitored.

Posttest: Group multiple-choice, 51-item test in which all 40 words were tested.

Results:	Oral	Nonoral	(Uninstructed Control)
	$\bar{X}$=31	$\bar{X}$=25	$\bar{X}$=12

t = 4.8, P < .01 level

Also found that males learned significantly more than females through the programmed instruction (t = 3.65, significant at .01 level).

Author's Evaluation: "Completion of the program by 26 different teams in three different schools constituted replications of the experiment. That the same results were obtained in each situation is evidence that the findings are reliable and testifies to the standardization of treatment. The controlled procedures permitted even identical intonation and pacing of verbal content in lessons given to all children.... Unlike most findings from classroom experimentation, this study did not reflect the degree of enthusiasm of the teacher or the determination to make the method succeed." (p. 41)

McNeil, John D. "Programmed Instruction Versus Usual Classroom Procedures in Teaching Boys to Read." American Educational Research Journal, 1 (March 1964), pp. 113-119.

Tested the hypothesis that teachers behave differently toward boys and girls and that such teacher behavior is related to performance in beginning reading. Kindergarten pupils were taught 40 words by an autoinstructional approach, and word recognition measures were used to determine sex differences. Children were then tested on word recognition skills after four months of instruction with female teachers in first grade. When reading was taught by female teachers, girls were superior on the word recognition measures. However, contrary to the usual expectations of female superiority, the boys outperformed the girls when auto-instructional techniques were employed, which suggests that consideration should be given to the appropriateness of traditional classroom procedures in teaching reading to boys.

Malpass, Leslie F., and others. "Automated Instruction for Retarded Children." American Journal of Mental Deficiency, 69 (November 1964), pp. 405-412.

Contrasted two automated procedures for teaching word recognition and spelling skills to educable mentally retarded children with an individual tutoring method and conventional classroom instruction. Institutional and public school children were matched and randomly assigned to the instructional groups. Seventy-two words were selected from 100 in the Dolch-Buckingham Word List. The two automated groups made the greatest gains on the 28 nonprogramed words from the list of 100 words. Gains for the tutorial group were equal to those obtained using automated procedures, but retention was not as great.

Ruddell, Robert H. "The Effect of Four Programs of Reading Instruction with Varying Emphasis on the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning on Achievement in First Grade Reading." 1965. U.S. Department of Health, Education and Welfare, Office of Education, Cooperative Research Project #2699.

Summary: An investigation of the effect on word recognition and reading comprehension of two published reading programs and the effect of supplementing these two programs by materials designed to build awareness and understanding of language structure as related to meaning. As one of the two published programs he chose the Sullivan Associate Programmed Reading series for vocabulary materials utilizing to a high degree consistent grapheme-phoneme correspondence. For the contrasting program he chose a basal reading series which makes little provision for consistent grapheme-phoneme correspondences in the vocabulary which is introduced. For this study, pupils in twenty-four first grade classrooms in Oakland, California participated. These classrooms were selected so that there would be a wide range of socio-economic characteristics represented in the population of 553 students.

Hypothesis 1. That first grade reading programs with a high degree of consistency in grapheme-phoneme correspondences would result in singificantly higher word reading, word study skills and regular word identification achievement scores. This hypothesis was tested by comparing scores on standardized tests of the experimental and control group students.

Hypothesis 2. That reading programs with special emphasis on language structure as related to meaning will result in significantly higher paragraph meaning comprehension and sentence meaning comprehension achievement scores. To test this hypothesis, both the Programmed Reading and the basal program were supplemented with special materials.

Results: At the end of one year of instruction, the students were tested on the reading subtests of the Stanford Achievement Test and other tests of Sentence Meaning and Regular Word Identification.

The Programmed Reading groups scored significantly higher than the basal reader groups in tests of word reading and regular-word identification. The Programmed Reading groups to whom the additional supplementary instruction was given, significantly outscored the augmented basal instruction groups in word study skills as well.

With respect to outcomes obtained in paragraph meaning comprehension achievement scores and sentence meaning comprehension scores, Programmed Reading plus the emphasis in language structure resulted in significantly higher paragraph meaning and sentence meaning comprehension than the Programmed Reading without the emphasis. This same effect did not occur in the basal augmented versus basal alone programs.

From "A Report of Eight Studies Comparing Programmed Reading With Other Reading Instruction Systems in Grades One and Two, a publication of McGraw-Hill Book Company, October, 1967, pp. 7-9.

Also in Reading Teacher, 19, (May 1966), pp. 653-660.

A P P E N D I X C

Pupil Data

T A B L E 7

Ranking of Pupils According to Current P.R. Book

Pupil	Sex	P.R. Book	Total Reading Score (SRA 3/68)	I.Q. (CAL 11/67	Chronological Age (3/68)
			FIRST GRADE P.R. CLASS		
1	F	16	4+	132	6-9
2	F	15	4+	127	6-5
3	M	14	4+	104	6-11
4	F	13	4+	114	6-5
5	F	13	2-8	102	6-5
6	M	13	3-4	132	6-7
7	F	12	3-2	117	7-0
8	M	12	3-7	110	6-8
9	F	11	3-8	122	6-4
10	F	11	3-2	107	6-7
11	F	10	2-9	112	6-10
12	F	10	2-6	103	6-9
13	M	10	4+	109	6-6
14	F	9	2-7	113	6-3
15	M	9	2-2	106	6-5
16	M	9	3-2	116	6-11
17	F	9	2-6	108	6-6
18	F	9	2-4	125	6-8
19	M	9	2-6	115	6-4
20	F	9	2-5	103	6-8
21	M	4	1-6	96	6-8

T A B L E 7, Continued

Ranking of Pupils According to Current P.R. Book

Pupil	Sex	P.R. Book	Total Reading Score (SRA 3/68)	I.Q. (CAL 11/67)	Chronological Age (3/68)
			SECOND GRADE P.R. CLASS		
1	M	21+	4+	124	7-11
2	M	21	4+	120	7-4
3	M	21	4+	129	7-9
4	F	21	4+	122	7-5
5	M	20	4+	110	7-11
6	F	20	3-8	105	7-10
7	F	20	4+	110	8-0
8	M	20	4+	99	8-2
9	M	19	3-7	105	7-5
10	F	19	3-6	113	7-7
11	F	18	4+	121	7-4
12	M	17	2-6	98	7-7
13	M	16	3-5	97	7-11
14	M	15	3-7	104	7-8
15	M	15	4+	112	7-4
16	M	14	3-5	110	7-9
17	F	14	2-1	91	7-10
18	M	14	2-7	137	7-3
19	M	12	2-6	116	8-0